SEX AND AGE RATIOS OF SOME JAPANESE BIRDS

BY H. ELLIOTT McCLURE

OVER a period of more than two years, from July 1, 1950, to January 1, 1953, nearly 3,000 birds were collected in Japan, mainly by shooting (some were netted). Blood serum from these specimens was tested for neutralizing antibodies to Japanese B encephalitis virus. Since the presence of virus in mosquitoes is a midsummer phenomenon and the birds appeared to be more susceptible to attack by the virus when young, it became desirable to know when the avian population had the largest percentage of juveniles. During the period of active field work the interest lay in the collection of blood, and not particularly in the sex and age ratios of the birds. Every bird that passed before the gun was taken and, when feasible, this was continued with each species until 10 or more specimens were collected.

The object of this paper is to present the accumulated data without drawing generalizations upon the sex and age ratios of Japanese birds, since the number of specimens collected is too small in many cases. It was considered that the desired information concerning the period of greatest incidence of juveniles was obtained by a review of the age ratios of collected birds and by corollary studies of nesting species. The raw data are summarized here in order to make them available to other workers who might be engaged in investigations of age and sex ratios.

Most of the specimens were collected within a 40-mile radius of Tokyo. An additional series of several hundred was taken in Hokkaido, Northern Honshu, and in Kyushu. The habitats selected for collecting included tidal flats, marshlands, rice paddies, upland farms and forest. The upland habitat types were mixed deciduous-evergreen forest with the associated subdivisions. All of the habitats were dominated and greatly altered by man's activities.

Except where there were obvious plumage differences, such as those of the Gray Thrush (*Turdus cardis*), the sex was determined by dissection. Specimens of uncertain sex are not included in Table 1.

First-year passerine birds were separated from adults on the basis of cranial examination. Cranial "ossification" takes place rapidly in the passerine forms as demonstrated by Nero (1951. *Wilson Bull.*, 63:84–88). It progresses in a conspicuous pattern and usually is completed by midwinter. Only those individuals in which the cranium was examined are listed in Table 2.

SEX RATIOS

In the present study 2,311 specimens of 183 species were sexed. The numbers examined each month were as follows: January, 97; February,

TABLE 1

MALE-FEMALE RATIO* OF ABUNDANT BIRDS OF JAPAN, BASED UPON SPECIMENS COLLECTED FROM JULY 1, 1950, TO JANUARY 1, 1953

Species	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Snowy Egret (*Egretta garzetta garzetta*)	—	—	—	—	1:0	1:2	2:0	—	9:12	4:1	1:0	1:1	19:16
Lesser Egret (*Egretta intermedia intermedia*)	—	—	—	—	2:3	5:4	3:1	2:0	8:28	—	—	—	20:36
Black-crowned Night Heron (*Nycticorax nycticorax nycticorax*)	—	—	—	—	1:3	2:4	2:2	0:2	17:18	—	4:4	—	26:33
Kentish Plover (*Charadrius alexandrinus nihonensis*)	1:1	—	0:1	6:2	7:2	0:1	—	—	7:4	2:5	1:1	4:1	28:18
Common Sandpiper (*Actitis hypoleucos*)	—	—	3:2	3:3	—	—	—	1:1	5:6	2:1	—	—	14:13
Eastern Turtle Dove (*Streptopelia orientalis orientalis*)	1:1	0:1	1:0	5:0	0:1	—	—	6:6	0:1	0:3	1:1	1:0	15:14
Skylark (*Alauda arvensis*)	0:2	—	6:1	17:7	1:0	6:1	—	4:0	5:3	8:5	2:0	1:2	50:21
House Swallow (*Hirundo rustica*)	—	—	4:4	—	—	—	2:1	7:2	—	1:0	—	—	14:7
Thick-billed Crow (*Corvus levaillantii japonensis*)	0:1	—	4:2	1:4	—	0:1	—	1:0	—	8:6	2:3	—	16:17
Carrion Crow (*Corvus corone orientalis*)	—	—	3:7	4:5	—	—	1:0	—	1:0	5:9	4:6	—	19:27
Blue Magpie (*Cyanopica cyanus japonica*)	—	1:1	—	1:0	3:2	1:1	8:2	5:3	0:3	—	2:1	—	21:13
Japanese Jay (*Garrulus glandarius*)	—	0:1	1:0	0:1	—	—	—	—	1:0	16:9	6:0	2:0	26:11
Brown-eared Bulbul (*Ixos amaurotis*)	0:1	2:2	4:2	7:4	—	—	—	—	—	7:7	4:4	2:1	26:21
Dusky Thrush (*Turdus naumanni*)	5:3	2:1	2:6	5:6	—	—	—	—	—	—	3:4	1:1	18:21
Pied Wagtail (*Motacilla alba lugens*)	0:1	—	9:4	5:5	—	—	—	—	—	4:3	4:4	1:3	23:20
Bull-headed Shrike (*Lanius bucephalus bucephalus*)	2:0	0:1	5:0	4:1	—	0:1	0:1	0:1	3:4	7:2	1:0	0:3	22:14
Ashy Starling (*Sturnus cineraceus*)	4:3	1:0	7:4	11:11	3:3	5:6	17:11	32:4	22:16	12:4	2:2	4:5	119:69
Tree Sparrow (*Passer montanus*)	0:3	1:0	5:6	5:3	13:19	7:8	13:18	25:6	8:4	38:30	7:10	3:7	124:113
Oriental Greenfinch (*Chloris sinica*)	1:0	1:1	7:7	12:3	0:1	—	1:0	—	—	1:0	6:5	6:1	35:18
Meadow Bunting (*Emberiza cioides ciopsis*)	4:1	1:0	10:2	2:1	1:0	1:1	—	1:1	0:1	1:4	5:12	4:11	30:24
Male-female Ratio*	18:17	7:8	71:48	88:56	32:34	28:30	49:36	84:26	86:100	116:89	55:57	30:36	665:547
Ratio of males to 100 females	105	87	148	150	94	93	136	323	86	130	96	83	123

*Figures are the actual numbers examined.

32; March, 214; April, 264; May, 127; June, 135; July, 141; August, 149; September, 289; October, 417; November, 319; and December, 123. The sex ratio based upon the total specimens and for all species was 120 males to 100 females.

Based upon the total specimens collected each month the sex ratios, expressed as males per 100 females, were as follows: January, 100:100; February, 110:100; March, 130:100; April, 150:100; May, 130:100; June, 150:100; July, 130:100; August, 240:100; September, 83:100; October, 120:100; November, 100:100; and December, 110:100. For November, December, January, and February the ratio was 100:100. In March and April, when the males were setting up territories, were singing conspicuously and were collected easily, the observed ratio rose to 145:100. During May, June, and July, when the females were secretive and occupied with nesting, the ratio remained at 140:100. With the autumn influx of young into the population, the ratio rose to 240:100. Since males may be less secretive than females and juveniles probably are less wary than adults, the appearance of juveniles in the population might weight the collections toward males. This probably accounted for the preponderance of males in August. With dispersal and migration during September and October, the ratio returned nearly to equality. It is to be emphasized that these ratios represent only those existing in the collections made and are not necessarily those of the existing population. The sex ratios of the 20 species collected most commonly are listed in Table 1. The figures presented above include data from all the 183 species collected.

Age Ratios

Since many of the specimens collected were sent to museums and since ripping of the scalp would damage the skin, only 1906 passerines were examined for cranial ossification. The numbers of passerines examined each month were: January, 22; February, 13; March, 95; April, 105; May, 49; June, 41; July, 99; August, 225; September, 126; October, 211; November, 101; and December, 52. The ratios showing incomplete ossification (immature) to complete ossification (adult) among the passerines were as follows: January, 5:100; February, 0:100; March, 1:100; April, 0:100; May, 81:100; June, 70:100; July, 312:100; August, 450:100; September, 300:100; October, 174:100; November, 300:100; and December, 62:100. The percentages of incompletely ossified crania are given in Table 2. Both methods of presenting the data show a normal accession and recession of young birds in the population.

Many factors combine to produce this phenomenon, most conspicuous of which is the maturation of the crania. In some species early migration of juveniles would affect the apparent age ratio, but for resident forms, the area under study in Japan was large enough to include the local movements of juveniles. A differential loss of individuals, greater in juveniles than in adults (Hickey, 1952. *Special Sci. Rept., Wildlife no. 15, U.S. Fish and Wildlife Serv.*), would affect the change in age ratios as well. However, because juveniles probably are less wary than adults, the data probably are weighted toward juveniles. In spite of these variables it is believed that the method used was of value in identifying the period when the habitats were permeated most heavily by birds of the year. Table 2 lists 12 of the passerine species collected in numbers greater than 25 and lists the actual numbers examined for age characters.

TABLE 2

ADULT—IMMATURE RATIOS OF SOME JAPANESE PASSERINES, BASED UPON SPECIMENS COLLECTED FROM JULY 1, 1950, TO JANUARY 1, 1953

Species	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Skylark	2:0	—	9:0	24:0	1:0	4:2	—	3:1	8:0	10:4	2:0	3:0	66:7
House Swallow	—	—	8:0	—	—	0:1	1:1	6:30	—	0:1	—	—	15:33
Thick-billed Crow	1:0	—	6:0	5:0	—	0:1	—	1:3	—	11:4	5:0	—	29:8
Carrion Crow	—	—	10:0	10:0	—	—	0:1	0:4	1:2	10:6	5:5	1:0	37:18
Blue Magpie	—	2:0	—	1:0	5:0	2:0	5:11	4:11	0:9	2:3	1:6	—	22:40
Japanese Jay	—	1:0	1:0	1:0	—	—	—	—	0:1	6:18	2:4	2:0	13:23
Brown-eared Bulbul	1:0	4:0	8:0	11:0	—	—	—	—	—	11:5	1:9	3:0	39:14
Bull-headed Shrike	3:0	1:0	5:0	5:0	—	0:1	0:2	1:2	5:2	7:2	1:0	3:0	31:9
Ashy Starling	7:0	1:0	10:0	21:0	4:2	5:6	10:23	15:85	16:32	10:14	3:2	8:1	110:165
Tree Sparrow	3:0	1:0	12:1	8:0	16:19	11:6	8:36	9:46	1:43	8:72	2:22	4:10	83:254
Oriental Greenfinch	1:0	2:0	14:0	16:0	1:0	—	0:1	0:1	0:1	0:1	0:13	6:2	40:19
Meadow Bunting	4:1	1:0	11:0	3:0	0:1	2:0	—	2:1	1:4	2:4	3:15	2:7	31:33
Adult—Immature Ratio*	21:1	13:0	94:1	105:0	27:22	24:17	24:75	41:184	32:94	77:134	25:76	32:20	516:623
Per cent with Immature Cranial Characteristics	5	0	1	0	46	41	75	81	74	62	75	38	

*Figures are the actual numbers examined.

SUMMARY

From July 1, 1950, to January 1, 1953, nearly 3,000 birds were collected in Japan for serological study, and the majority were sexed and aged by dissection. The overall sex ratio was 120 males to 100 females. The ratio varied from month to month as changes in activities of each species changed their availability to the gun. The fall age ratio in passerines (based on ossification of the crania) was three immature birds per adult. Of 183 species collected, peak numbers of juveniles were taken in September. This peak came in August in the 12 most common passerine species.

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